Notice of Allowability	Application No.	Applicant(s)	
	09/540,113	RENZ ET AL.	
	Examin r	Art Unit	
	Tiffany A Fetzner	2859	

-- The MAILING DATE of this communication appears on the cover sheet with th correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *04/09/2004*.

2. ☐ The allowed claim(s) is/are *1-7,9 and 11-16*.

3. ☒ The drawings filed on *06/17/03 fig 5-7 & 03/31/2000 Fig. 1-4* are accepted by the Examiner.

4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☒ All b) ☐ Some* c) ☐ None of the:
      1. ☒ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

6. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 06/20/2004.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date _____
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other _____.

Examiner's Comment

Formal Drawings

1. New corrected FORMAL drawings are required in this application because the June 17th 2003 submission of corrected drawings did not include a complete set of the applicant's examiner approved figures, (i.e. only sheet 3/3 corrected figures 5-7 were submitted). Applicant needs to file New FORMAL DRAWINGS of figures 5 through 7 submitted 06/17/2003, which include the examiner approved changes; and FORMAL DRAWINGS of figures 1 through 4 (i.e. sheets 1/3 and 2/3) which were originally filed on March 31st 2000. Applicant is advised to employ the services of a competent patent draftsperson outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

Canceled Claims

2. The examiner notes that **claims 8** and **10 were previously canceled** by the RCE response of October 31st 2003.

Response to Arguments

3. Applicant's arguments filed 04/09/2004 have been fully considered and applicant's arguments of page 5 paragraph 4, through page 8 paragraph 2 are persuasive because the examiner agrees that components 45 of the **Wong et al.,** patents **'069** and **'137** fail to meet the limitations of applicant's claims as amended April 9th 2004. Specifically, the examiner agrees that the structures of the antenna identified as component number 45 in these references are not functionally operable for emitting or receiving magnetic field energy at a magnetic resonance frequency, as per applicant's arguments on page 4 paragraph 4 through page 8 paragraph 2 of the April 9th 2004 amendment response.

The following is an examiner's statement of **Reasons for Allowance**:

4. **Amended Independent Claim 1,** from the April 9th 2004 amendment response is considered to be allowable over the prior art of record, because the prior art of record fail to teach suggest or show: a nuclear magnetic resonance antenna, which comprises the combinational structural features of "a plurality of at least five antenna elements disposed in a plane for emitting or receiving magnetic field energy at a magnetic resonance frequency, each antenna element having an element beginning in said plane and an element end in said plane; said antenna elements being disposed relative to a center axis so as to radiate from the respective element beginnings to the respective element ends outwardly in a spoke-like fashion to allow a radially directed current flow in each antenna element between the element end thereof and the element beginning thereof, and exhibiting cyclical symmetry from antenna element to antenna element; said antenna elements being at least magnetically coupled with each other in said antenna".

5. **Amended Independent Claim 14,** from the April 9th 2004 amendment response is considered to be allowable over the prior art of record, because the prior art of record fail to teach suggest or show a nuclear magnetic resonance antenna, which comprises the combinational structural features of "a plurality of at least five antenna elements **for emitting or receiving magnetic field energy at a magnetic resonance frequency,** each antenna element having an element beginning and an element end, the respective element beginnings defining an element beginning plane and the respective elements ends defining an element end plane, said element beginning plane and said element end plane being parallel to and spaced from each other; said antenna elements being disposed relative to a center axis so as to radiate from the respective element beginnings to the respective element ends to allow a radially directed current to flow in each antenna element between the element end thereof and the element beginning thereof, and exhibiting cyclical symmetry from antenna element to antenna element; the respective antenna elements being linear and three-dimensionally straight to define respective line directions, said line directions intersecting said center axis at a common point outside of said element beginning plane and outside of said element end plane; and said antenna elements being at least magnetically coupled with each other in said antenna".

6. These amended independent claims are considered to be allowable over the prior art of record because each of these claims, contains a novel and non-obvious combinational nuclear magnetic resonance antenna structure that is not found within the prior art of record. It is the entire combination of structural features, taken as a whole, that is the novelty of each of applicant's independent claims, and it is combination of the NMR antenna's structural features that distinguishes applicant's application from the prior art.

7. The configuration of component numbers 45 found in the **Wong et al.;** references, is not functionally operable to emit or receive RF energy at a magnetic resonance frequency. Component 45 is not an operational antenna segment. In the **Srinivasan '797** antenna shown in figure 10, the antenna is not planar as required for **amended independent claim 1**, and the antenna is not "linear and three-dimensionally straight to define respective line directions, with said line directions intersecting said center axis at a common point outside of said element beginning plane and outside of said element end plane;" as required for **amended independent claim 14**. The examiner also notes that applicant's antenna segments, (i.e. component number 1 in applicant's figures 1-7) have no intervening elements present between the "spoke-like" respective beginnings and ends of applicant's antenna elements, which enables applicant's claimed feature of "said antenna elements being disposed relative to a center axis so as to radiate from the respective element beginnings to the respective element ends outwardly in a spoke-like fashion to allow a radially directed current flow in each antenna element between the element end thereof and the element beginning thereof," which is not found in the prior art references of record such as **Srinivasan '797.**

8. The prior arts of record **Edelstein, Slade, Pissanetzky et al., R.L. Barrish et al., Prammer et al., Hashoian et al., Oppelt et al., McArthur, Srinivasan et al., '797, '479; Wong et al., '069, '137;** and **Mansfield;** do not teach, suggest, or show the entire combination of limitations as set forth by applicant, which comprise applicant's NMR antenna structure. It would not have been obvious to one of ordinary skill in the art, at the time that the invention was made to alter the known antenna structures to include the components of applicant's structure, because the prior art of record, do not require **a plurality of at least five antenna segments in a configuration which satisfies applicant's claims.** Applicant's claim requires a combination of features for an NMR antenna structure which teaches away what is known in the art, and is therefore considered to be both novel and nonobvious by the examiner.

9. With respect to dependent **claims 2-7, 9,** and **13**, which depend from amended independent **claim 1**, and **dependent claims 11, 12 15** and **16** which depend from **amended independent claim 14**, each of these claims are considered to be allowable by the examiner because they depend from an allowable independent claim, therefore the same reasons for allowance, novelty and nonobviousness, that apply to **amended independent claims 1,** and **14** also apply to Dependent **claims 2-7, 9, 11-13, 15** and **16**, and need not be reiterated.

10. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Prior Art made of Record

1. The **prior art made of record** and not relied upon is considered pertinent to applicant's disclosure.

A) **McArthur** US patent 2,735,074 issued Feb. 14th 1956; which shows a magnetic resonance reactance antenna device. [Figure 6]

B) **Oppelt et al.,** US patent 5,153,517 issued Oct. 6th 1992; An MRI RF coil structure.

C) **Hashoian et al.,** US patent 5,168,230 issued December 1st 1992. [See Figures 1, 2, 4 and the entire disclosure in general, which is similar to, and cites the prior art Edelstein reference.]

D) **Prammer et al.,** US patent 6,268,726 issued July 31st 2001, filed January 15th 1999. [See Figures 4, 22a, 22b, 25, 26]. Which show an MR antenna in an NMR logging tool.

E) **R.L. Barrish et al.**, US patent 2,281,404 issued April 28th 1942. Early MR RF antenna structure.

F) **Pissanetzky et al.,** US patent 5,659,281 issued August 19th 1997. [See Figures 3a, 3b Which shows an MRI RF antenna coil structure].

G) **Slade** US patent 6,215,304 B1 issued April 10th 2001, filed January 19th 1999 with a priority date of January 21st 1998. [See Figure 3 which shows an RF antenna sensor for NMR well logging]

H) **Definition number 4** of [1]**radial** on page 962 of **Merriam Webster's Collegiate Dictionary Tenth Edition 1997 ="developing uniformly around a central axis".**

I) **Mansfield** US patent 5,143,688 issued September 1st 1992 ; which shows an elliptical surface coil structure for use within magnetic fields.

J) **Edelstein** US patent 4,620,155 which shows a multi segment RF NMR antenna structure.

K) **Srinivasan et al.,** US patent 5,602,479 issued February 11th 1997, which shows a multi segment RF NMR birdcage antenna structure where the antenna components are in more than one plane.

L) **Srinivasan et al.,** US patent 6,177,797 B1 issued January 23rd 2001 [See figures 11a, 9a, 9b, and 10 which shows a multi segment RF NMR birdcage antenna structure where the antenna components are in more than one plane.] Figure 10 does not meet applicant's claim because the coil is volumetric not planar, in Figure 11a the structure which would appear to resemble applicant's

structure is an RF shield, not an emitting/receiving antenna. It cannot function as claimed by applicant.

M) **Wong et al.,** US patent 5,474,069 issued December 12th 1995. Component numbers 45 are not functionally operable for emitting or receiving magnetic field energy at a magnetic resonance frequency, as per applicant's arguments on pages 4 paragraph 4 through page 8 paragraph 2 of the April 9th 2004 amendment response.

N) **Wong et al.,** US patent 5,372,137 issued December 13th 1994. Component numbers 45 are not functionally operable for emitting or receiving magnetic field energy at a magnetic resonance frequency, as per applicant's arguments on pages 4 paragraph 4 through page 8 paragraph 2 of the April 9th 2004 amendment response.

O) **Tropp** US patent 6,535,084 B1 issued March 18th 2003, filed December 27th 2000. This reference is not available as prior art because applicant's effective priority date is April 1st 1999.

P) **Tropp** US patent 6,232,779 B1 issued May 15th 2001, filed August 25th 1999. This reference is not available as prior art because applicant's effective priority date is April 1st 1999.

Conclusion

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tiffany Fetzner whose telephone number is: (571) 272-2241. The examiner can normally be reached on Monday-Thursday from 7:00am to 4:30pm., and on alternate Friday's from 7:00am to 3:30pm.

12. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez, can be reached at (571) 272-2245. The **only official fax phone number** for the organization where this application or proceeding is assigned is **(703) 872-9306**.

Tiffany A. Fetzner
TAF
June 21, 2004

Diego Gutierrez
Supervisory Patent Examiner
Technology Center 2800

CHRISTOPHER W. FULTON
PRIMARY EXAMINER